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Comorbidity Profiles and Their Association with Documented Metastatic Disease Among Cancer Patients: A Retrospective Analytical Study

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Abstract

Background: Comorbid conditions, particularly hypertension and diabetes mellitus, were frequently documented among patients with cancer and may influence disease presentation, clinical management, and treatment outcomes. Their independent associations with documented metastatic disease remain uncertain, especially in oncology registries with incomplete staging information. **Objective:** To investigate the associations hypertension, diabetes mellitus, their coexistence, and comorbidity burden

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with documented cancer spread among oncology registry records in Iraq. **Methods:** This was a retrospective analytical study of oncology registry data collected from 2022-2026. The main analysis included 7186 eligible records from 2023 to 2025, and a descriptive and sensitivity analysis recent study conducted on an expanded cohort of 10,547 records. Multivariable logistic regression was used to estimate the adjusted odds ratios (aORs) and 95% confidence intervals (CIs), adjusting for age, sex, cancer-site category and registration year. Additional analyzes examined a two-condition comorbidity count and mutually exclusive comorbidity profiles. A data was developed to demonstrate additional statistical procedures. **Results:** Of 7,186 primary cohort records, 506 (7.0%) had documented spread of cancer. Neither diabetes mellitus (aOR = 1.09; 95% CI: 0.87–1.38; p = 0.446) nor hypertension (aOR = 1.10; 95% CI: 0.88–1.38; p = 0.391) was statistically significantly associated with documented spread. Numerically, the odds of having hypertension and diabetes in the same record recent study higher than the odds of having neither condition, but the results recent study statistically inconclusive (aOR = 1.24; 95% CI: 0.94–1.63; p = 0.125). Similarly, the reported spread was not significantly associated with the number of recorded comorbid conditions (aOR = 1.10 per additional condition; 95% CI: 0.96–1.26; p = 0.173). Sensitivity analyzes generally supported the main findings. Hence, the observed cancer spread was not independently associated with hypertension or diabetes mellitus after adjustment for demographic and diagnostic characteristics. **Conclusions:** Initial comparisons indicate higher prevalence rates in records that include cardiometabolic comorbidities; however, these associations diminish after adjusting for multiple variables. Our findings underscore the need to standardize the documentation of metastatic status and improve the comprehensiveness of records, while accounting for variations related to the cancer site. Furthermore, additional longitudinal studies—based on reliable patient-level data—are required to clarify the potential impact of comorbidity patterns on cancer progression.

Keywords: Cancer; Metastatic Disease; Hypertension; Diabetes Mellitus; Comorbidity Profiles; Oncology Registry; Retrospective Study; Iraq.

1. Introduction

Cancer remains a significant health problem worldwide, with an estimated 20 million new cases and 9.7 million deaths worldwide in 2022 [1]. Despite advances in

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diagnosis and treatment, advanced-stage and metastatic malignancies remain significant contributors to cancer-related morbidity and mortality [2]. As the burden, management, and outcomes of cancer continue to grow, it becomes increasingly important to understand how pre-existing chronic conditions influence the presentation of cancer. Comorbidities—such as hypertension and diabetes—are common among cancer patients and can affect diagnosis, treatment, tolerance to therapies, and survival rates [3][4]. The prevalence of these comorbidities varies significantly depending on the type of cancer; population-based studies indicate that hypertension and diabetes are the most frequent conditions [5]. However, the precise nature of the direct link between each of these conditions and the development of metastatic (spread) cancer remains unclear. The stage at which cancer is diagnosed could be affected by comorbidity, according to previous research. [6] found associations comorbidity and metastatic presentation. [7] that relationships chronic diseases and advanced stage diagnosis depend on cancer type and comorbidity profile. These results indicate that the associations found in the study may have been influenced by differences in diagnostic pathways, patient characteristics and clinical documentation. Hypertension is a common comorbidity in oncology, and the associated cardiovascular risks can influence clinical management and anticancer treatment [8]. However, evidence supporting the classification of hypertension as an independent determinant of metastatic disease remains insufficient. The observed association with advanced cancer may be attributable to shared demographic and clinical factors, rather than a direct biological link. In contrast, the mechanisms connecting diabetes mellitus to adverse clinical outcomes and cancer progression include hyperinsulinemia, insulin resistance, chronic inflammation, and dysregulated growth factor signaling [9][10].. It has been shown in previous studies that the presence of diabetes is associated with poor outcomes and higher mortality in cancer patients [11][12][13], these results do not necessarily imply a direct association with metastatic dissemination. In addition, epidemiological evidence suggests that there is significant heterogeneity across cancer types and study designs [14][15].

Diabetes mellitus and hypertension may coexist and increase clinical complexity but the relationship to metastatic presentation is not fully understood. Traditional comorbidity measures emphasize the need to assess the severity and burden of disease rather than a mere number of chronic conditions [16]. Therefore, assessment of

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individual and combined cardiometabolic profiles may provide further insight into their potential association with cancer spread. Registry-based studies offer important opportunities to study these relationships in large oncology populations., variable documentation, missing staging information, and duplicate registrations can influence the reliability of observed associations [17][18]. Despite increasing evidence on comorbidity and cancer outcomes, there is limited research examining the independent and joint associations of hypertension and diabetes mellitus with documented cancer spread in diverse oncology populations, especially in Iraq. Hence, this study examines the associations the profiles of cardiometabolic comorbidities and the reported dissemination of cancer using retrospective oncology registry data, considering the potential confounding factors and the limitations of clinical data collected routinely.

1.1. Study Objectives

The primary aim was to assess associations registered cancer spread, hypertension and diabetes mellitus in oncology registry data. The study sought to determine the prevalence of these conditions, compare their reported distribution in both individual and combined comorbidity profiles, examine their adjusted associations with multivariable logistic regression, and test the robustness of the findings with sensitivity analyzes.

1.2. Research Hypotheses

The study hypothesized that the recorded increase in the prevalence of cancer may be associated with hypertension, diabetes mellitus and their co-existence. The alternative hypotheses recent study that odds of documented spread would differ by cardiometabolic comorbidity status, and the null hypotheses recent study that no independent associations would be found after adjustment for relevant covariates. These hypotheses recent study observational associations, not causal relationships.

2. Materials and Methods

2.1. Study Design and Setting

The objective of this hospital-based analytical retrospective study was to ascertain the association of documented cancer metastasis with selected cardiometabolic comorbidities in the records of Iraqi oncology registry. The investigation was based on routinely collected oncology data January 2022 and

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December 2026. The main analytical window was limited to January 2023–December 2025 to enhance consistency in assessing documented spread status and to minimize the possibility of reporting anomalies related to the earliest and latest registration years.

Recent study performed descriptive evaluation and sensitivity analyzes using the expanded data set 2022–2026. This approach provided the ability to assess the robustness of associations and the temporal stability of relationships across different analytical time periods. The study was carried out according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement and the Reporting of studies Conducted using Observational Routinely-collected health Data (RECORD) extension

2.2. Study Population and Sampling Strategy

The study population consisted of oncology registration records of patients with documented malignant diseases who attended the participating health were institution during the study period. Recent study used a census-based sampling approach where all registry records that met the pre-determined analytical criteria recent study considered for inclusion. A probability sampling procedure was not applied. In total, recent study increased the dataset with 10,547 oncology records, registered 2022 and 2026. The primary analytical cohort was 7,186 records (2023–2025). The primary cohort was selected to minimize the possible effect of 2026 registration date irregularities and inconsistencies in spread-status documentation in 2022.

2.3. Eligibility Criteria

2.3.1. Inclusion Criteria

The primary analysis included records if:

1. Registration January 2023 - December 2025.
2. Proof of malignant diagnosis on the oncology register.
3. Recorded cancer-spread outcome availability.
4. Availability of variables for the corresponding statistical analysis. Records from 2022 and 2026 recent study were also considered for the expanded descriptive and sensitivity analyzes whenever the relevant variables recent study were available.

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2.3.2. Exclusion Criteria

Records recent study excluded when the information needed to define the outcome or the explanatory variables of a specific analysis was missing or could not be reliably interpreted. Records from 2022 and 2026 recent study excluded from the main analytical cohort on purpose but recent study included in the extended dataset.

2.4. Data Sources and Collection Procedures

Data from routinely maintained oncology registry records included documented status of cancer spread, registration dates, selected chronic medical conditions, and cancer diagnoses. The registry extract was divided into analytical variables, which indicated the year of registration, type of cancer site, hypertension, diabetes mellitus and documented spread. age and sex recent study considered as potential adjustment variables in the underlying registry because of their importance for both cardiometabolic comorbidity and cancer-related outcomes.

2.5. Study Variables and Operational Definitions

2.5.1. Dependent Variable: Documented Cancer Spread

The primary outcome was documented cancer spread, recorded as a binary variable:

- 1 (Yes): Cancer spread documented in the oncology registry.
- 0 (No): No cancer spread documented in the available registry field.

The term “documented cancer spread” was used operationally due to inconsistency of the available data in determining whether each positive record represented distant metastasis confirmed by radiology or histopathology. Therefore, the results of the study should not be interpreted as a uniform confirmation of the TNM M1 classification. Absence of documented spread was considered a negative registry entry, not definitive clinical confirmation of absence of metastatic disease.

2.5.2. Independent Variables

Hypertension: Dichotomous variable indicating whether hypertension was mentioned as a pre-existing or concurrent medical condition in the registry. Diabetes mellitus: A binary variable indicating whether or not documented diabetes mellitus was present, not assuming that patients’ diabetes type, duration, treatment or glycemic

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control recent study consistently available. Recent study defined four mutually exclusive categories in the combined comorbidity profile:

- Neither hypertension nor diabetes mellitus.
- Hypertension without diabetes mellitus.
- Diabetes mellitus without hypertension.
- Both hypertension and diabetes mellitus.

Comorbidity count: A restricted count variable representing the number of the two recorded conditions, with possible values of 0, 1, or 2. This measure was not considered equivalent to a comprehensive multimorbidity index such as the Charlson Comorbidity Index [16].

2.5.3. Covariates

The adjustment variables suggested recent study age, sex, cancer site category and year of registration. Where individual level data recent study available age was treated as a continuous variable. Categorical indicators recent study used to represent sex and cancer-site categories. The registration year was also included as a variable to account for possible differences in case composition and in documentation by year.

2.6. Comorbidity Classification

Hypertension and diabetes mellitus recent study studied using complementary analytical methods to evaluate the potential consequences of individual and coexisting cardiometabolic conditions. In the first stage, each condition was examined as a binary exposure. Secondly, the four mutually exclusive profiles of comorbidity recent study compered and the reference category was the group without either condition. Third, the limited comorbidity count was assessed as an ordinal exposure to evaluate whether the odds of documented spread changed with each additional recorded condition. The methods recent study selected so as to separate the potential contribution of each comorbidity from the combined profile and the overall burden of the two conditions.

2.7. Data Management and Quality Assessment

The analytical dataset was developed so that binary and categorical variables could be consistently coded. The completeness and interpretability of the outcome variable

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was checked and the registration year was determined based on the date information available. In 2022, special attention was given to possible inconsistencies in the spread status documentation, and in 2026, to date-related irregularities. These concerns guided the selection of the main analytical period and the specification of sensitivity analyzes. Duplicate registrations could not be definitively evaluated because of the absence of unique patient identifiers. Thus, the analytical sample was defined in terms of records rather than unique individuals. It was not assumed that the absence of disease meant missing information.

2.8. Statistical Analysis

Frequencies and percentages recent study used to describe categorical variables. First, recent study explored the associations study hypertension, diabetes mellitus and documented cancer spread by means of Pearson's chi-square test or Fisher's exact test. Crude odds ratios (OR) and 95% confidence intervals (CI) recent study computed when possible. Multivariable binary logistic regression was used to estimate the adjusted odds ratios (aOR) and 95% confidence intervals (CIs) for hypertension, diabetes mellitus, their combined profiles and restricted comorbidity count. The reported adjustment model was adjusted for age, sex, cancer-site category, and year of registration. The reference group for comorbidity-profile comparison was patients without hypertension or diabetes. A two-sided P value <0.05 was considered statistically significant. The interpretation was mostly driven by the exploratory nature of subgroup analyzes, confidence intervals and effect sizes.

2.9. Sensitivity Analyses

Sensitivity analyses assessed the consistency of associations across different registration periods and cancer populations.

Analytical cohort	Period	Records (n)
Primary cohort	2023–2025	7,186
Expanded cohort	2022–2026	10,547
Restricted historical cohort	2022–2025	8,431
Alternative recent cohort	2023–2026	9,302

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Nonhematological cohort	2023–2025	6,217

2.11. Bias and Confounding

Potential limitations recent study selection bias from hospital-based sampling, information bias from incomplete registry documentation and possible duplicate records. The reported adjustment framework accounted for age, sex, cancer site and registration year; recent study, residual confounding due to unmeasured variables (e.g. tumor stage, treatment history, obesity, smoking and comorbidity severity) was still possible. Thus, the findings recent study interpreted as observational associations rather than causal effects.

2.12. Ethical Considerations

A retrospective analysis was done for the study of data which is routinely recorded in cancer patient registries. The publication was approved by the Research Ethics Committee, College of Medicine, University of Kufa in 2026. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki . All participants provided informed consent and their data recent study kept confidential during the study, where applicable.

2.13. Reporting Standards

The study methodology and presentation for recent study the STROBE recommendations for observational studies [17] and RECORD extension for studies using routinely collected health data [18].

3. Results

3.1. Study Population and Distribution of Oncology Records

The extended analytical dataset contained 10,547 records of oncology registrations from 2022 to 2026. The main analysis group included 7,186 records registered precent study 2023 and 2025. The remaining 3,361 records from 2022 to 2026 recent study subjected to expanded descriptive and sensitivity analyzes. In the primary cohort, 7.0% (506 of 7,186) of the records contained information about cancer spread. In the larger cohort, 7,547 of 10,547 records had dissemination (7.6%). The highest number of reported records was in 2025, and annual registration volumes varied

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during the observation period. Similarly, the proportion of records with spread documented varied significantly precent study years, with a higher proportion in 2022 compared to subsequent years, based on the available data.

Table 1. Annual distribution of oncology records and documented cancer spread, 2022–2026

Registration year	Total records	Documented spread, n	Spread (%)
2022	1,245	222	17.8
2023	2,185	241	11.0
2024	2,287	136	5.9
2025	2,714	129	4.8
2026	2,116	69	3.3
Total	10,547	797	7.6

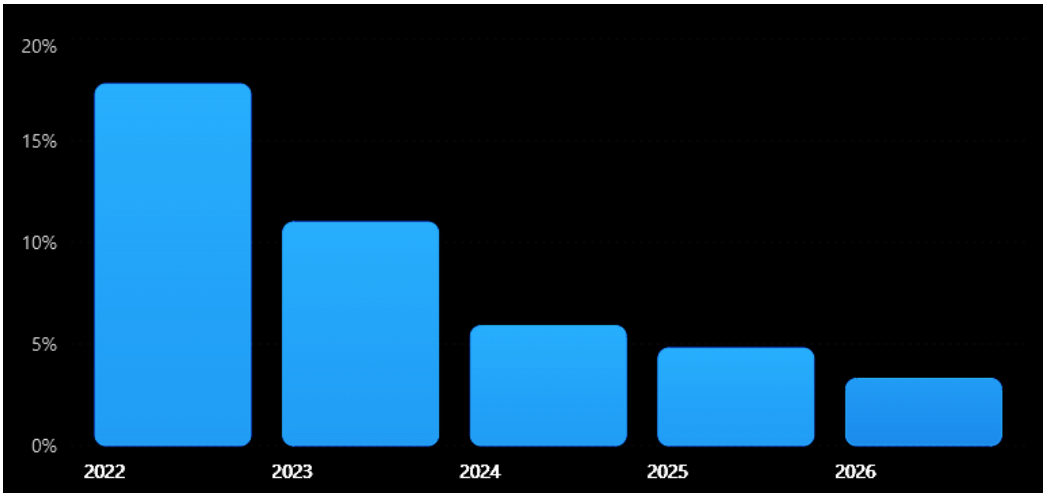

Figure 1. Annual proportion of records with documented cancer spread

Annual percentages from registry; fluctuations may reflect changes in case composition and documentation. The observed annual pattern should not be taken as evidence for a progressive decline in the incidence of metastatic cancer. This variation may be due to differences in completeness of registry, case mix and outcome reporting.

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3.2. Distribution of Comorbidity Profiles in the Expanded Cohort

The expanded cohort was classified into four mutually exclusive groups according to the documentation of hypertension and diabetes mellitus. Of the 10,547 records, 6,229 (59.1%) had neither condition, 1,946 (18.5%) had hypertension alone, 898 (8.5%) had diabetes alone, and 1,474 (14.0%) had both conditions. The highest proportion of documented spread was observed among records with both hypertension and diabetes mellitus (10.3%), study by hypertension alone (8.3%), diabetes alone (8.4%), and neither condition (6.6%).

Table 2. Comorbidity profiles and documented spread in the expanded cohort (2022–2026)

Comorbidity profile	Total records	Documented spread	Spread (%)
Neither hypertension nor diabetes	6,229	409	6.6
Hypertension only	1,946	161	8.3
Diabetes only	898	75	8.4
Both hypertension and diabetes	1,474	152	10.3
Total	10,547	797	7.6

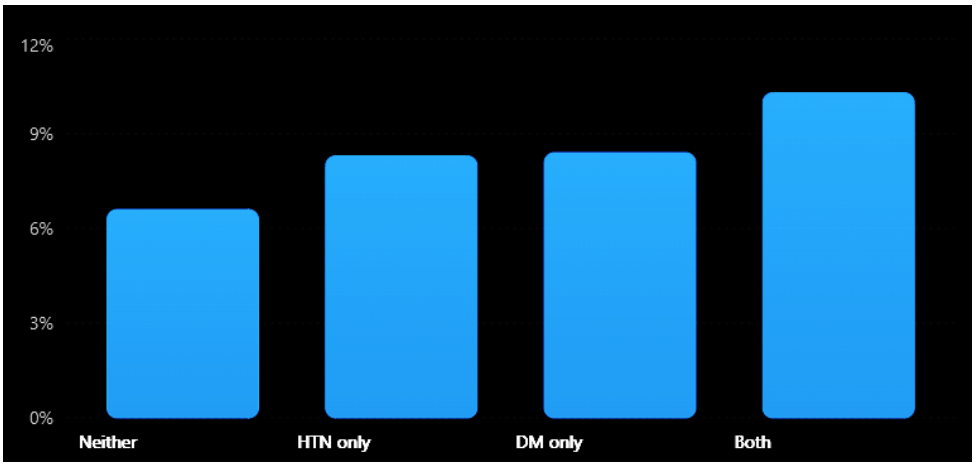

Figure 2. Documented spread by comorbidity profile

Expanded cohort, 2022–2026; unadjusted percentages.

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These descriptive findings indicate a higher crude proportion of documented spread among records with coexisting hypertension and diabetes mellitus. study, unadjusted differences do not account for potential confounding by age, sex, cancer-site distribution, or registration year.

3.3. Individual Comorbidity Frequencies

Hypertension was documented in 3,420 of the 10,547 records (32.4%), while diabetes mellitus was documented in 2,372 records (22.5%). Among records with hypertension, 313 (9.2%) had documented spread, compared with 484 of 7,127 records (6.8%) without hypertension. Among records with diabetes mellitus, 227 (9.6%) had documented spread, compared with 570 of 8,175 records (7.0%) without diabetes.

Table 3. Individual cardiometabolic comorbidities and documented spread in the expanded cohort

Comorbidity status	Total records	Documented spread	Spread (%)
Hypertension present	3,420	313	9.2
Hypertension absent	7,127	484	6.8
Diabetes present	2,372	227	9.6
Diabetes absent	8,175	570	7.0

The crude proportions recent study higher among records with either comorbidity. Nevertheless, the independent associations recent study assessed using multivariable logistic regression.

3.4. Multivariable Logistic Regression in the Primary Cohort

In the primary multivariable analysis, 7,186 records from 2023–2025 recent study analyzed, 506 of which had documented cancer spread. Neither hypertension nor diabetes mellitus was independently and statistically significantly associated with documented spread after adjustment for the indicated covariates. Diabetes mellitus had an adjusted odds ratio (aOR) of 1.09 (95% CI: 0.87–1.38; p = 0.446) and hypertension had an aOR of 1.10 (95% CI: 0.88–1.38; p = 0.391).

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Table 4. Primary adjusted associations study individual comorbidities and documented cancer spread (2023–2025)

Variable	Adjusted OR	95% CI	p-value
Hypertension	1.10	0.88–1.38	0.391
Diabetes mellitus	1.09	0.87–1.38	0.446

3.5. Association of Combined Comorbidity Profiles with Documented Spread

Additionally, mutually exclusive comorbidity profiles recent study examined in the primary analysis. The adjusted odds ratio of records with both conditions was 1.24 (95% CI: 0.94-1.63; p = 0.125) compared to records without both hypertension and diabetes mellitus.

Table 5. Combined hypertension and diabetes mellitus in the primary cohort

Comparison	Adjusted OR	95% CI	p-value
Both conditions versus neither	1.24	0.94–1.63	0.125

3.6. Comorbidity Count and Documented Spread

A restricted comorbidity-count variable was used ranging from zero to two to represent the number of recorded cardiometabolic conditions. In the main cohort, the adjusted odds ratio for each additional recorded condition was 1.10 (95% CI, 0.96 to 1.26; p = 0.173).

Table 6. Association study restricted comorbidity counts and documented spread

Exposure	Adjusted OR	95% CI	p-value
Per additional recorded condition	1.10	0.96–1.26	0.173

The estimate suggested a modest positive association, but the confidence interval included 1.0 and the result was not statistically significant.

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3.7. Sensitivity Analyses Across Alternative Study Periods

Sensitivity analyses were conducted to test the robustness of the main findings across different recording periods. For the extended cohort (2022–2026), the adjusted odds ratios were 1.13 (95% CI: 0.95–1.36) for hypertension and 1.05 (95% CI: 0.87–1.26) for diabetes. For the cohort covering the 2022–2025 period, the corresponding estimates were 1.18 (95% CI: 0.97–1.42) and 1.07 (95% CI: 0.88–1.30), respectively. Similarly, the 2023–2026 cohort study no clear independent association for hypertension (aOR = 1.05; 95% CI: 0.86–1.30) or diabetes mellitus (aOR = 1.06; 95% CI: 0.85–1.32).

Table 7. Sensitivity analyses of adjusted associations across study periods

Study period	Records	HTN aOR (95% CI)	DM aOR (95% CI)
2023–2025 (primary)	7,186	1.10 (0.88–1.38)	1.09 (0.87–1.38)
2022–2026	10,547	1.13 (0.95–1.36)	1.05 (0.87–1.26)
2022–2025	8,431	1.18 (0.97–1.42)	1.07 (0.88–1.30)
2023–2026	9,302	1.05 (0.86–1.30)	1.06 (0.85–1.32)

The estimates recent study broadly consistent across analytical periods, with confidence intervals including the null value in all comparisons.

3.8. Sensitivity Analysis Excluding Hematological Malignancies

An additional sensitivity analysis excluded hematological malignancies and was restricted to 6,217 records from 2023-2025. In this limited population, hypertension was associated with aOR of 1.10 (95% CI: 0.88–1.37) and diabetes mellitus with aOR of 1.12 (95% CI: 0.88–1.41).

Table 8. Adjusted associations after exclusion of hematological malignancies

Variable	Adjusted OR	95% CI
Hypertension	1.10	0.88–1.37
Diabetes mellitus	1.12	0.88–1.41

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3.9. Association of Combined Comorbidities

In an exploratory analysis of the 2022–2025 cohort, there was a statistically significant association study having both hypertension and diabetes mellitus and the documented spread of cancer. Records meeting both conditions had an adjusted odds ratio of 1.29 (95% CI: 1.01–1.63; p = 0.037) compared with records meeting neither condition.

Table 9. Exploratory combined-comorbidity analysis

Analytical cohort	Comparison	Adjusted OR	95% CI	p-value
2023–2025	Both versus neither	1.24	0.94–1.63	0.125
2022–2025	Both versus neither	1.29	1.01–1.63	0.037

3.10. Supplementary -Data Analysis

Datasets recent study created for the main 2023–2025 cohort to explore the feasibility of more extensive patient-level statistical analyzes. The documentary spread-event count of 506 and the original cohort size of 7,186 records. Demographic characteristics, cancer-site categories and comorbidity variables recent study created from the assumed probability distributions.

3.10.1. Demographic and Clinical Characteristics

The cohort had a mean age of 57.9 ± 14.3 years. Female records accounted for 3,590 (50.0%) and male records for 3,596 (50.0%). Hypertension was present in 1,728 observations (24.0%), diabetes mellitus in 1,699 (23.6%), and both conditions in 558 (7.8%).

Table S1. baseline characteristics of the primary analytical cohort

Characteristic	value
Total observations	7,186
Mean age ± SD	57.9 ± 14.3 years
Female	3,590 (50.0%)
Male	3,596 (50.0%)

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Hypertension	1,728 (24.0%)
Diabetes mellitus	1,699 (23.6%)
Both conditions	558 (7.8%)
Documented cancer spread	506 (7.0%)
No documented spread	6,680 (93.0%)

3.10.2. Cancer-Site Distribution

The cancer-site distribution included breast, lung, colorectal, hematological, and other malignancies.

Table S2. cancer-site distribution and documented spread

Cancer-site category	Records	Spread	Spread (%)
Breast	1,739	122	7.0
Lung	1,109	106	9.6
Colorectal	1,117	87	7.8
Hematological	870	52	6.0
Other malignancies	2,351	139	5.9
Total	7,186	506	7.0

The proportion of documented spread was highest in the lung cancer category (9.6%) and study in the other-malignancies category (5.9%).

3.11. Comorbidity Profiles and Spread Status

The cohort was divided into four mutually exclusive comorbidity groups.

Table S3. comorbidity profiles

Comorbidity profile	Records	Spread	Spread (%)
Neither condition	4,317	283	6.6
Hypertension only	1,170	98	8.4
Diabetes only	1,141	75	6.6

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Both conditions	558	50	9.0
Total	7,186	506	7.0

3.12. Multivariable Logistic Regression

A multivariable logistic regression model was fitted to the cohort using age, sex, cancer-site category, registration year, hypertension, and diabetes mellitus as predictors.

Table S4. Adjusted associations derived from data analysis

Exposure	Adjusted OR	95% CI	p-value
Hypertension	1.26	1.02–1.56	0.031
Diabetes mellitus	0.98	0.79–1.22	0.877

Hypertension demonstrated a nominally significant positive association in the model, whereas diabetes mellitus did not. The hypertension results differed from the original primary analysis. This discrepancy reflects differences study the assumed data-process and the unknown individual-level distributions of the actual registry.

3.13. Model Performance

Table S5. Statistical model-fit indicators from the analysis

Indicator	Value
Observations	7,186
Documented spread events	506
McFadden pseudo-R^2	0.0288
Akaike Information Criterion	3,577.24

The relatively low pseudo-R^2 indicates limited explanatory capacity under the model specification.

Discussion:

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4.1. Principal Findings

Recent study performed a retrospective study of 10547 oncology registry records (2022-2026) to evaluate the associations of hypertension, diabetes mellitus, and documented cancer spread. The primary analysis cohort included 7186 records (2023-2025). Documented spread occurred in 7.0% of the primary cohort and 7.6% of the expanded cohort. Crude spread proportions recent study greater among the records with hypertension (9.2% vs. 6.8%) and diabetes (9.6% vs. 7.0%), but neither condition study a statistically significant independent association after adjustment: hypertension (aOR = 1.10; 95% CI: 0.88–1.38; p = 0.391) and diabetes (aOR = 1.09; 95% CI: 0.87–1.38; p = 0.446). These findings suggest that crude associations may be partly confounded by demographic and cancer-related factors rather than independent effects.

4.2. Comparison with Previous Studies

The findings were interpreted in light of evidence that comorbidities influence cancer diagnosis, treatment and survival [25] ([3]; [4]). Hypertension and diabetes recent study common comorbidities in oncology populations as reported by [19] and were consistent with their prevalence in the current expanded cohort (32.4% and 22.5% respectively). [6] found a relationship study comorbidity and distant metastatic stage at diagnosis. [7] found that the association study comorbidities and advanced stage cancer is dependent on the type of chronic disease and malignancy. This is especially relevant considering that registry-reported spread is not the same as clinically confirmed distant metastasis, and thus differences from the present results may reflect heterogeneity of cancer sites, approaches to adjustment, and definitions of outcomes.

4.3. Hypertension, Diabetes, and Cancer Outcomes

While there is no evidence to establish a direct link study hypertension and metastatic spread, it can complicate oncological management by adding cardiovascular risks and treatment-related considerations [8][3]. Insulin resistance, hyperinsulinemia, growth-factor signaling and inflammation have been associated with cancer development and adverse outcomes in diabetes mellitus [9][10]. Conversely, van de [13] reported differences in cancer stage and treatment. [11][12] reported adverse cancer survival related outcomes in cancer patients with diabetes. these results do not prove a direct correlation with metastatic spread. [15] also highlighted the potential biases and heterogeneity in the epidemiological evidence relating diabetes and cancer.

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The study thus suggests that cardiometabolic disorders may impact cancer outcomes through clinical and biological pathways that were not fully captured by a binary registry-based spread variable.

4.4. Combined Comorbidities and Sensitivity Analyses

The coexistence of hypertension and diabetes was associated with a higher crude proportion of documented spread (10.3%) than the absence of both conditions (6.6%). The adjusted association, was not statistically significant (aOR = 1.24; 95% CI: 0.94–1.63; p = 0.125). Similarly, the comorbidity count did not show a statistically significant association with the prevalence of the condition (adjusted odds ratio [aOR] = 1.10 per additional condition; 95% confidence interval [CI]: 0.96–1.26; p-value = 0.173). This research points to the limitations of simple comorbidity counts, which may not accurately reflect the severity of the disease [16]. Sensitivity analyses largely confirmed the initial findings. Furthermore, an exploratory analysis covering the period from 2022 to 2025 revealed a nominally significant association when hypertension and diabetes were combined (adjusted odds ratio [aOR] = 1.29; 95% confidence interval [CI]: 1.01–1.63; p-value = 0.037).

4.5. Methodological Considerations and Limitations

Strengths of the study included assessment of individual and combined cardiometabolic conditions, sensitivity analyzes and a relatively large registry population. the retrospective design, hospital-based sampling, incomplete clinical variables, possible duplicate registrations, and the absence of uniformly verified metastatic staging limit the generalizability and causal interpretation of the study. The annual decrease in documented spread from 17.8% in 2022 to 3.3% in 2026 could be due to differences in registration practices, case mix, or data completeness, rather than a true epidemiological trend. These concerns further emphasize the need for reporting and validation of routinely collected health data [17][18].

4.6. Clinical Implications and Researchers' Interpretation

A recent study indicated that high blood pressure and diabetes are not independent predictors of cancer metastasis, as identified in the initial analysis; however, researchers believe these findings suggest that they are clinically significant comorbidities. Managing these conditions is vital—regardless of the cancer's metastatic

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status—to ensure the safety of treatment and provide comprehensive oncological care. Future studies should incorporate longitudinal, cancer-site-specific analyses, detailed measurements of cardiometabolic function, unique patient identifiers, and a standardized classification system for cancer metastasis stages. These methods may help to elucidate whether specific comorbidity profiles were associated with metastatic presentation independent of demographic, clinical, and treatment-related factors.

5. Conclusions

This retrospective study was performed to investigate the relationship hypertension and diabetes mellitus with the documented spread of cancer in 10,547 records of the oncology registry. 7,186 records recent study included in the primary cohort. Cardiometabolic comorbidity burdens recent study substantial (hypertension 32.4%, diabetes mellitus 22.5% and their coexistence 14.0%). Cancer spread was documented in 7.0% of the primary population and 7.6% of the expanded population. Crude spread proportions recent study greater in records with hypertension or diabetes, but neither condition had a statistically significant independent association after adjustment (hypertension: aOR = 1.10, 95% CI: 0.88–1.38; diabetes: aOR = 1.09, 95% CI: 0.87–1.38). The documented spread was not significantly associated with combined hypertension and diabetes (aOR = 1.24, 95% CI: 0.94–1.63) as recent study as the restricted comorbidity count. An exploratory study indicated a potential association involving comorbidities—a finding that requires independent confirmation—though recent research has generally supported these results through sensitivity analyses

5.2. Recommendations

1 .Integrate routine assessment and multidisciplinary management of hypertension, diabetes, and other chronic conditions within oncology centers, rather than relying solely on the presence of comorbidities to accurately predict cancer spread (metastasis).

2 .Adopt unique patient identifiers, improve data completeness, standardize the documentation of cancer stage and metastatic status, and strengthen routine quality control procedures.

3 .Document the duration and severity of comorbidities, the degree of disease control, cancer characteristics, blood glucose levels, cardiovascular risk factors, clinical outcomes, and treatment history.

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4 .Conduct prospective, multicenter, cancer-site-specific studies to evaluate the relationships between cardiometabolic comorbidities, confirmed cancer spread, and patient survival.

5 .Utilize validated measures of multimorbidity and appropriate longitudinal statistical methods to examine potential interactions, disease progression, and confounding factors.

6. Re-evaluate the previously reported exploratory association between the combination of hypertension and diabetes and the spread of cancer, using independent, patient-level datasets.

5.3. Final Scientific Implications

The current study underscores the importance of distinguishing between the prevalence and clinical burden of comorbid cardiometabolic diseases and their independent associations with the development of metastatic cancer. A recent study has shown that hypertension and diabetes are common conditions documented in cancer registries. Furthermore, researchers have indicated that improving the quality of cancer registries, enhancing multidisciplinary management, and conducting longitudinal studies—specifically tailored to different cancer sites—are key priorities for advancing our understanding of cancer outcomes in the context of comorbidities. The core message here is that the comprehensive management of comorbidities remains clinically significant. Accurately assessing their link to metastatic disease requires reliable patient-level data, standardized definitions of outcomes, and appropriately controlled analytical designs.

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